



**Entergy**

Entergy Operations, Inc.

River Bend Station  
5485 U.S. Highway 61N  
St. Francisville, LA 70775  
Tel 225-381-4157

**William F. Maguire**  
Site Vice President

RBG-47781

August 21, 2017

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555

Subject: Licensee Event Report 50-458 / 2017-007-00  
River Bend Station – Unit 1  
Docket No. 50-458  
License No. NPF-47

RBF1-17-0095

Dear Sir or Madam:

In accordance with 10 CFR 50.73, enclosed is the subject Licensee Event Report. This document contains no commitments. If you have any questions, please contact Mr. Tim Schenk at 225-381-4177.

Sincerely,

WFM / dhw

Enclosure

cc: U. S. Nuclear Regulatory Commission  
Region IV  
1600 East Lamar Blvd.  
Arlington, TX 76011-4511

NRC Sr. Resident Inspector  
P. O. Box 1050  
St. Francisville, LA 70775

INPO  
(via ICES reporting)

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Central Records Clerk  
Public Utility Commission of Texas  
1701 N. Congress Ave.  
Austin, TX 78711-3326

Department of Environmental Quality  
Office of Environmental Compliance  
Radiological Emergency Planning and Response Section  
Ji Young Wiley  
P.O. Box 4312  
Baton Rouge, LA 70821-4312



## LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

|   |                               |                   |
|---|-------------------------------|-------------------|
| 1. FACILITY NAME<br>River Bend Station – Unit 1 | 2. DOCKET NUMBER<br>05000-458 | 3. PAGE<br>1 OF 3 |
|---|-------------------------------|-------------------|

## 4. TITLE

Automatic Reactor Scram due to Failure of Main Generator Voltage Regulator Mode Transfer Relay

| 5. EVENT DATE |     |      | 6. LER NUMBER |                   |         | 7. REPORT DATE |     |      | 8. OTHER FACILITIES INVOLVED |               |
|---------------|-----|------|---------------|-------------------|---------|----------------|-----|------|------------------------------|---------------|
| MONTH         | DAY | YEAR | YEAR          | SEQUENTIAL NUMBER | REV NO. | MONTH          | DAY | YEAR | FACILITY NAME                | DOCKET NUMBER |
| 06            | 23  | 2017 | 2017          | 007               | 00      | 08             | 21  | 2017 | FACILITY NAME                | DOCKET NUMBER |
|               |     |      |               |                   |         |                |     |      |                              | 05000         |
|               |     |      |               |                   |         |                |     |      | FACILITY NAME                | DOCKET NUMBER |
|               |     |      |               |                   |         |                |     |      |                              | 05000         |

| 9. OPERATING MODE | 11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) |   |  |   |
|-------------------|---|---|--|---|
| 1                 | <input type="checkbox"/> 20.2201(b)   | <input type="checkbox"/> 20.2203(a)(3)(i)   | <input type="checkbox"/> 50.73(a)(2)(ii)(A)            | <input type="checkbox"/> 50.73(a)(2)(viii)(A) |
|                   | <input type="checkbox"/> 20.2201(d)   | <input type="checkbox"/> 20.2203(a)(3)(ii)  | <input type="checkbox"/> 50.73(a)(2)(ii)(B)            | <input type="checkbox"/> 50.73(a)(2)(viii)(B) |
|                   | <input type="checkbox"/> 20.2203(a)(1)  | <input type="checkbox"/> 20.2203(a)(4)      | <input type="checkbox"/> 50.73(a)(2)(iii)              | <input type="checkbox"/> 50.73(a)(2)(ix)(A)   |
|                   | <input type="checkbox"/> 20.2203(a)(2)(i)   | <input type="checkbox"/> 50.36(c)(1)(i)(A)  | <input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A) | <input type="checkbox"/> 50.73(a)(2)(x)       |
| 10. POWER LEVEL   |   |   |  |   |
| 100               | <input type="checkbox"/> 20.2203(a)(2)(ii)  | <input type="checkbox"/> 50.36(c)(1)(ii)(A) | <input type="checkbox"/> 50.73(a)(2)(v)(A)             | <input type="checkbox"/> 73.71(a)(4)          |
|                   | <input type="checkbox"/> 20.2203(a)(2)(iii)   | <input type="checkbox"/> 50.36(c)(2)        | <input type="checkbox"/> 50.73(a)(2)(v)(B)             | <input type="checkbox"/> 73.71(a)(5)          |
|                   | <input type="checkbox"/> 20.2203(a)(2)(iv)  | <input type="checkbox"/> 50.46(a)(3)(ii)    | <input type="checkbox"/> 50.73(a)(2)(v)(C)             | <input type="checkbox"/> 73.77(a)(1)          |
|                   | <input type="checkbox"/> 20.2203(a)(2)(v)   | <input type="checkbox"/> 50.73(a)(2)(i)(A)  | <input type="checkbox"/> 50.73(a)(2)(v)(D)             | <input type="checkbox"/> 73.77(a)(2)(i)       |
|                   | <input type="checkbox"/> 20.2203(a)(2)(vi)  | <input type="checkbox"/> 50.73(a)(2)(i)(B)  | <input type="checkbox"/> 50.73(a)(2)(vii)              | <input type="checkbox"/> 73.77(a)(2)(ii)      |
|                   | <input type="checkbox"/> 50.73(a)(2)(i)(C)  | <input type="checkbox"/> OTHER              | Specify in Abstract below or in NRC Form 366A          |   |

## 12. LICENSEE CONTACT FOR THIS LER

## LICENSEE CONTACT

Tim Schenk, Manager – Regulatory Assurance

## TELEPHONE NUMBER (Include Area Code)

225-381-4177

## 13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

| CAUSE | SYSTEM | COMPONENT | MANU-FACTURER | REPORTABLE TO EPIX | CAUSE | SYSTEM | COMPONENT | MANU-FACTURER | REPORTABLE TO EPIX |
|-------|--------|-----------|---------------|--------------------|-------|--------|-----------|---------------|--------------------|
| X     | EL     | RLY       | GE            | yes                |       |        |           |               |                    |

## 14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE)☒ NO

## 15. EXPECTED SUBMISSION DATE

| MONTH | DAY | YEAR |
|-------|-----|------|
|       |     |      |

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On June 23, 2017, at 10:18 PM CDT, an unanticipated reactor scram occurred during scheduled testing of the main turbine generator. The plant was operating at 100 percent power at the time, and no safety-related equipment was out of service. A reactor recirculation system flow control valve runback occurred as designed, and the recirculation pumps properly downshifted to slow speed. The main feedwater system responded properly to control reactor water level. The scram signal was initiated by the closure of the main turbine control valves, which was an automatic response to a trip of the main generator. The associated steam pressure increase following turbine valve closure resulted in the actuation of 12 main steam safety-relief valves. A reactor water level 3 signal was received, as expected, following the turbine trip and reactor scram and was promptly restored to the normal reactor water level band. The non-safety related turbine building chillers tripped as a result of the electrical transient caused by the generator trip. One area served by that cooling system is the reactor water cleanup (RWCU) system heat exchanger room. Approximately 20 minutes after the scram, the temperature in that room exceeded the trip setpoint of the area temperature monitors, resulting in the automatic closure of the primary containment isolation valves for the RWCU system.

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
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|-----------------------------|------------------|---------------|-------------------|---------|
| River Bend Station – Unit 1 | 05000-458        | YEAR          | SEQUENTIAL NUMBER | REV NO. |
|                             |                  | 2017          | 007               | 00      |

**NARRATIVE****REPORTED CONDITION**

On June 23, 2017, at 10:18 PM CDT, an unanticipated reactor scram occurred during scheduled testing of the main turbine generator. The plant was operating at 100 percent power at the time, and no safety-related equipment was out of service. A reactor recirculation system flow control valve runback occurred as designed, and the recirculation pumps properly downshifted to slow speed. The main feedwater system responded properly to control reactor water level.

The scram signal was initiated by the closure of the main turbine control valves, which was an automatic response to a trip of the main generator. The associated steam pressure increase following turbine valve closure resulted in the actuation of 12 main steam safety-relief valves. A reactor water level 3 signal was received, as expected, following the turbine trip and reactor scram and was promptly restored to the normal reactor water level band.

The non-safety related turbine building chillers tripped as a result of the electrical transient caused by the generator trip. One area served by that cooling system is the reactor water cleanup (RWCU) system heat exchanger room. Approximately 20 minutes after the scram, the temperature in that room exceeded the trip setpoint of the area temperature monitors, resulting in the automatic closure of the primary containment isolation valves for the RWCU system.

This event is being reported in accordance with 10 CFR 50.73(a)(2)(iv)(A) as an unplanned actuation of the reactor protection system.

**INVESTIGATION**

At the time of the event, the operators were performing scheduled quarterly testing of the voltage regulator for the main generator [EL]. It has both a manual and automatic mode of operation.

Generator excitation is controlled by varying field current to the exciter, and field excitation is controlled by a static voltage regulator. The regulator includes both automatic and manual functions to regulate generator terminal voltage or generator field voltage, respectively.

When operating in manual control, the DC regulator holds the main generator field voltage constant. When operating in automatic control, the AC regulator holds the main generator output voltage constant. A transfer voltmeter is used for matching signals to provide a smooth transfer between the two regulators. A tracking circuit is provided to automatically match the two regulators. The regulator mode transfer relay (\*\*RLY\*\*) is energized by the automatic mode pushbutton to place the excitation system in automatic control. It is de-energized by the auto mode pushbutton, over excitation limit circuit, or high exciter field current.

The voltage regulator test is performed on a quarterly basis. At a specific point in the test, the "Voltage Regulator Mode Select MAN" pushbutton is depressed. The expected response would be a swap of the voltage regulator control to the manual mode from the automatic mode. This test had been successfully performed in March 2017, following the



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CONTINUATION SHEET**

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replacement of the mode transfer relay. During the test performed on June 23rd, the main generator tripped when that procedure step was performed.

**CAUSAL ANALYSIS**

The main generator trip and subsequent turbine trip and reactor scram was caused by a failed relay in the transfer circuit between the automatic and manual voltage regulation modes. The regulator mode transfer relay was changed in the March 2017 refueling outage as a scheduled 10-year preventive maintenance task. The failed relay has been shipped to a vendor for failure analysis. Possible signs of arcing were seen on several contact pins, but no definitive failure cause was found. The postulated failure mode could not be replicated. Since the relay had been in service for only 4 months, this is considered an "infant mortality" type of failure.

Based on the failure analysis, it was determined that the generator voltage regulator mode transfer relay failed to perform its function when the operator attempted to switch from the automatic mode to the manual mode. High electrical resistance measured across some of the contact pins exceeded the troubleshooting acceptance criteria. It is postulated that the relay contacts did not effectively change state during the test, and thus failed to provide continuous excitation to the voltage regulator, which led to the automatic generator trip.

**CORRECTIVE ACTION TO PREVENT RECURRENCE**

The voltage regulator mode transfer relay was replaced with an updated model that has demonstrated no vulnerability to the failure mode postulated to have caused this event.

**PREVIOUS OCCURRENCE EVALUATION**

No similar occurrence has been reported by River Bend Station in the last three years.

**SAFETY SIGNIFICANCE**

The plant response to this event was bounded by the Updated Safety Analysis Report analysis of a main generator load reject with steam bypass / pressure regulation in service. Thus, this event was of minimal significance to the health and safety of the public.

(NOTE: Energy Industry Identification System component function identifier and system name of each component or system referred to in the LER are annotated as (\*\*XX\*\*) and [XX], respectively.)